

CCRTS 2006
The State of the Art and the State of the Practice

Maintaining Situational Awareness in Large, Complex Organizations

For Topical Areas:

Cognitive Domain Issues
or
Social Domain Issues

Mr. Jose Carreno
Mr. George Galdorisi (Point of Contact)
Ms. Rebekah Goshorn (Student)

Space and Naval Warfare Systems Center San Diego
Office of Science, Technology and Engineering
53560 Hull Street
San Diego, CA 92152-5001
(619) 553-2104 (voice)
George.Galdorisi@navy.mil

Report Documentation Page			Form Approved OMB No. 0704-0188	
<p>Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p>				
1. REPORT DATE JUN 2006	2. REPORT TYPE	3. DATES COVERED 00-00-2006 to 00-00-2006		
4. TITLE AND SUBTITLE Maintaining Situational Awareness in Large, Complex Organizations			5a. CONTRACT NUMBER	
			5b. GRANT NUMBER	
			5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)			5d. PROJECT NUMBER	
			5e. TASK NUMBER	
			5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Space and Naval Warfare Systems Center San Diego,Office of Science, Technology and Engineering,53560 Hull Street,San Diego,CA,92152-5001			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)	
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited				
13. SUPPLEMENTARY NOTES The original document contains color images.				
14. ABSTRACT				
15. SUBJECT TERMS				
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 32
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified		19a. NAME OF RESPONSIBLE PERSON

Maintaining Situational Awareness in Large, Complex Organizations

Abstract

Maintaining situational and strategic awareness requires constant monitoring of information. Leaders often employ analysts to translate data into information. Today, with a plethora of sources of information, analysts must deal with “information overload,” a topic of much current discussion. Data mining, using technology to extrapolate patterns from data to direct an analyst to conduct more focused research, constitutes one solution. Another solution, gaining popularity in the business sector, is environmental scanning. Environmental scanning identifies, collects, translates and applies information about external events that influence an organization’s strategic landscape. Moreover, relying on technology to analyze data is not always an option; so for effective solutions, human analysts must remain paramount. As such, to comprehend its external environment an organization should establish and maintain a collaborative group tasked to provide situational awareness to its leadership.

This paper describes how to design such a dedicated collaborative team by focusing on the role that the Decision Support Group (DSG) plays at the Space and Naval Warfare Systems Center in San Diego (SSC San Diego). The DSG developed a customized process to transform data to information to knowledge and ultimately to understanding - through monthly environmental scans. Specific categories in the environmental scan facilitate this process; this paper will explore in greater detail the category of *technology* to describe how data is collected and information communicated. Analyzing the DSG’s process provides insight into how information is disseminated in a military facility focused in science and engineering research, and demonstrate its wide-scale applications beyond the military, including other science and technology entities, industry and academia.

Introduction

The focus of this paper is to address the theory behind continuous environmental scanning, and how it is applied to a United States Navy (USN) research lab: the Space and Naval Warfare Systems Center, San Diego (SSC San Diego). SSC San Diego is the USN’s research, development, test, evaluation, engineering and fleet support center for command, control and communication systems, as well as ocean surveillance. SSC San Diego provides technology and information resources to support and serve the joint Warfighter.

SSC San Diego was established as the Navy’s first West Coast Laboratory and currently employs more than three thousand civilian and military personnel, the majority of them scientists and engineers developing technology to meet the Navy’s needs of the future, as well as providing fleet support to keep current information systems running.

The Decision Support Group, a collaborative group of research analysts at SSC San Diego, performs the task of continuously scanning the environment in order to prepare monthly briefings for the Strategic Planning Meetings where all of the department heads, the

Commanding Officer and the Executive Director participate. The method of how the DSG creates the environmental scan at SSC San Diego will be analyzed in this paper; including a more in-depth look at the environmental scan as it applies to technology trends as a specific case study.

Analyzing the process utilized at SSC San Diego provides insight into how information is disseminated not only in a military facility, but also one that is focused on science and engineering research. Thus, there are wide scale applications as it encompasses multiple fields: Navy, the United States (U.S.) military writ large, business, and academia. Moreover, SSC San Diego represents roughly a 1.4 billion dollar a year enterprise; providing information to its leadership is no small task.

Establishing the Decision Support Group

To understand the context and purpose of a collaborative research team, it is important to review the process of establishing one. In order to establish a cooperative team of researchers, the founding members of the DSG looked for other examples to incorporate best practices. Recognizing that they served an organization whose vision is to be the preeminent provider of command, control, computers, communications, intelligence, surveillance and reconnaissance, (C4ISR) technology to the warfighter in the maritime domain, the founders of the DSG looked to a similar organization to draw lessons from. To this end, they looked to the Joint C4ISR Decision Support Center in Washington, D.C. as an example of a collaborative research team operating in a large, complex organization.

The Decision Support Center (DSC) was established as a result of the Joint Chief of Staff and the Department of Defense (DoD) collective efforts to establish a team of analysts specialized in tracking C4ISR developments. The purpose of the DSC is to “conduct quantitative and qualitative analysis to support C4ISR requirements and acquisition decision makers, leading to the transformation and continuous improvement of DoD integrated, networked, C4ISR capabilities for joint, interagency, and combined operations.”¹ Among its responsibilities, the DSC provides a comprehensive knowledge base, a means for cooperative action, and an objective analytic support element for DoD C4ISR modernization, as well as an institutionalized process for acquiring integrated solutions through teamwork and collaborative information networks. The DSC developed a network where information was accumulated by its analysts, and flowed throughout the organization, as well as to and from other organizations as depicted in Figure 1:²

¹ <https://extranet.itis.osd.mil/dsc/about/index.shtml> Joint C4ISR Decision Support Center.

² Decision Support Center (DSC), *Implementation Plan for Fiscal Year 1997*, 1997, p 32. Please see the Joint C4ISR DSC website for further details; www.dsc.osd.mil

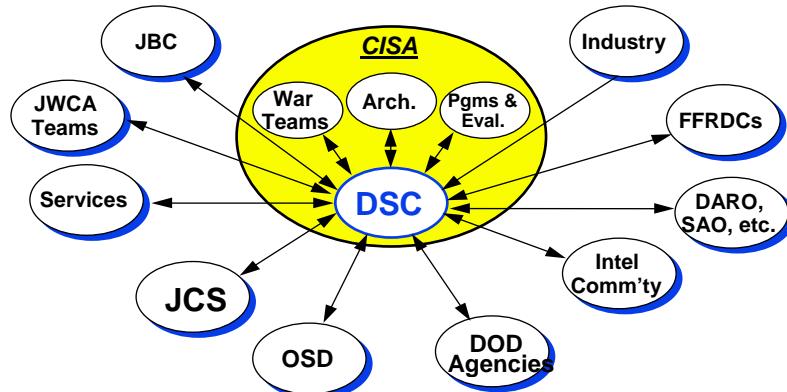


Figure 1: DSC Network of Information

Upon careful analysis of the processes and functions of the DSC, founders of the DSG gained several valuable insights. Amongst them, the importance of commitment from senior management in establishing a collaborative team for the sake of stability and to maintain unit cohesion. An additional insight recognized is that a team is only as good as the people in it and therefore conducting a talent search for individuals with a broad range of backgrounds is necessary when forming a group such as this. As of today, the disciplinary focus of the DSG expands from mathematics, to international relations, to economics, to business administration and law. Professionally speaking, its members have experience in the private sector and other government agencies, as well as a collective of 50 years experience in the United States Navy. Ultimately, as the DSC designed a network of information, the DSG created one; specifically a process for searching, analyzing and presenting information as portrayed in Figure 2.

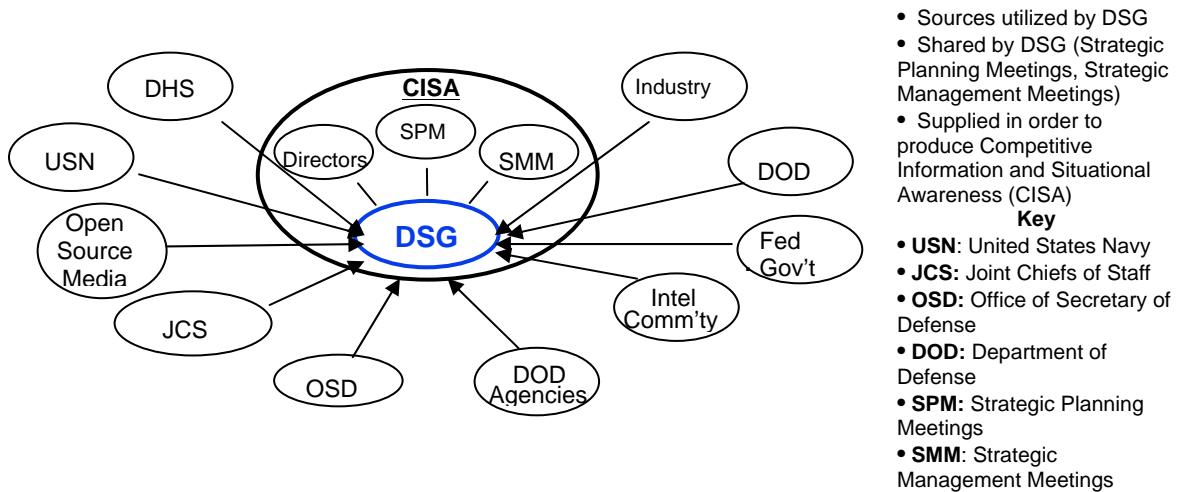


Figure 2: DSG Network of Information

Through constant assessment and reassessment of its practices, the DSG seeks to internalize and improve its processes in order to better serve the strategic needs of the Center.

Goals of the Decision Support Group

Although it is a government facility, SSC San Diego actually functions as a working capital fund; its existence relies upon revenue generated by projects it bids for and wins. This work is conducted primarily for the military services. No line item in the defense budget exists for SSC San Diego; it must find work to fund itself by competing against industry and other labs. Thus, while it does not make a profit (it is prohibited from doing so by law), the Center in many ways operates like a private enterprise, with a prevalent entrepreneurial culture among its scientists, engineers and managers. Given the competitive environment in which it operates, and the uncertainty of future funding, strategic planning and situational awareness constitute an imperative for the Center's leadership lest the Center find itself providing services and products of technological irrelevance.

Fomenting a shift from tactical to strategic thinking constitutes a challenge that is not easily overcome. Specifically, due to the myriad of activities and responsibilities that impact the leadership of the Center, it is difficult for them to delve into strategic issues given the deluge of tactical decisions that pervade their day-to-day activities. This problem becomes more acute when one considers the vast distance which separates the Center from the DC beltway, making it all the more difficult for them to remain abreast of developments in defense and national security policy.

As Mark Moore points out in *Creating Public Value-Strategic Management in Government*, managers (i.e. decision makers) must assume a strategic mindset and forgo a tactical one.³ Thinking strategically demands situational awareness, and providing this situational awareness constitutes the primary function of the DSG. Reporting directly to the Executive Director, the DSG provides short and long term analysis necessary for strategic planning, as well as guidance of the Center's strategic planning process. Because it is to some degree detached from the day-to-day tactical and operational decisions of the Center, the DSG enjoys a meta-level perspective of the strengths and weaknesses of the Center vis-à-vis its opportunities and threats.

In ensuring the Center leadership remains abreast of current, and pertinent, defense policy initiatives, technological advances, and military developments, the DSG provides the situational awareness necessary to avoid strategic surprise. Ultimately, the DSG aims to provide the leadership with enough information to act upon those factors it can influence before they impact the Center, and have a plan to deal with those over which it has little control over (e.g. Base Realignment and Closure). Action, not reaction, represents one of the primary qualities that the DSG aspires to inculcate into the Center leadership. Information and situational awareness constitute key components in achieving these goals. Our primary tool in this regard is the environmental scan. As illustrated in Figure 3, achieving situational awareness requires transforming data to relevant information for presentation to the leadership.

³ Mark Moore, *Creating Public Value-Strategic Management in Government*, (Cambridge): Harvard University Press, 1997, p. 20.

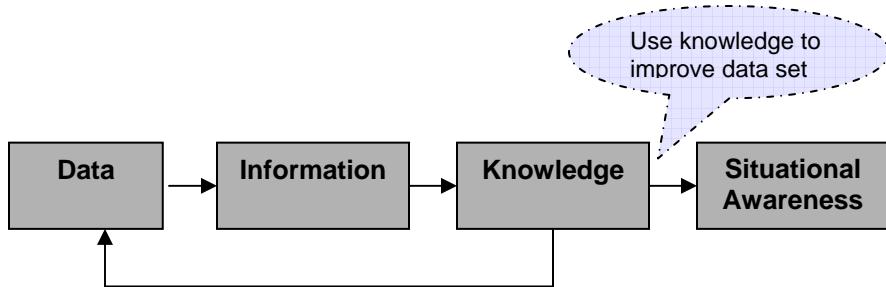


Figure 3: Process to Provide Situational Awareness⁴

Before delving into the intricacies of our environmental scan, a discussion of the theory and challenges innate to this form of information dissemination merits attention.

The Challenge of Providing Information

To achieve its primary goal of providing situational awareness to the Center leadership, DSG analysts must transform data into useful information. Increased collection and analysis of information remains paramount in providing the foundation necessary to increase awareness and understanding, and thereby support planning and decision making, ultimately developing effective actions.⁵ Making informed decisions emerges as crucial for the continued success of the organization in the short and long-term. It is crucial to understand the difference between recognizing and ignoring significant information that can result in either making an informed, strong decision or an ill-informed one.⁶ Determining when sufficient data has been gathered proves a difficult task given the plethora of information sources that have become increasingly available; in effect, information overload represents a key issue that collaborative analysts increasingly must deal with.

⁴ See also, *Naval Doctrine Publication 6: Command and Control* (Washington D.C.: 1995) Figure 2-2 “The Cognitive Hierarchy” p. 21 describing a process to obtain situational awareness within the Navy Combatant environment as also a four step process:

“The first step toward understanding is gathering data – the building blocks of understanding...to be meaningful, however, these [data] must be processed so that the people who must use them can understand them...Processing involves organizing, formatting, collating, filtering, plotting, and all other functions that turn data into information. Within this context, ‘information’ is the name we assign to date once it is collected from the environment and processed into usable form...Information allows us to generate knowledge through cognition: the act of learning, of integrating various pieces of processed data. Knowledge results from analyzing, correlating, and fusing data that have been processed and evaluated as to their reliability, relevance, and importance...Finally by applying judgment, we transform knowledge into understanding. Judgment is a purely human skill, based on experience, expertise, and intuition...Understanding is distilled from knowledge that has been synthesized and applied to a specific situation to gain a deeper level of awareness...Understanding equates to situational awareness...”

Publication available at <http://navsci.berkeley.edu/ns12b/Documents/ndp6.pdf>

⁵ Alberts, David, *Defensive Information Warfare*, (Washington D.C.: National Defense University, 1996), p. 64

⁶ Alberts, David, John J. Garstka, Richard E. Hayes, David A. Signori, *Understanding Information Age Warfare*, (Washington D.C.): CCRP 2001.

Information overload has become increasingly problematic as more and more data has become available through modern technology. During the 1980s information was distributed through books, periodicals, academic journals and so forth. These barriers to entry, as it were, were removed with the advent of the Internet and the digital age; and as a result open source information is boundless. Concurrent with these technological innovations, a culture of information sharing has evolved with, among other things, a diffusion of online newsletters, email distribution lists, blogs, and a myriad of websites on every conceivable subject. This deluge of available information creates information overload. Consequently, parsing out relevant data and transforming it to useful information in a timely manner emerges as a daunting task. The predominant problems associated with information overload are that there is more material than can be absorbed and understood within a time span of any single individual. This was the subject of a paper “How Much Information is Enough? Decision-Making and Cognitive Analysis” at a recent command and control symposium.⁷ This paper notes that the problem that problem of information overload can often be overcome by providing enhanced strategies for analysts. Additionally, as this paper points out, it is often impossible to find or ascertain all key elements of information and this results in subsequent problems of understanding, synthesizing and fusing all of the gathered data into valued and presentable information.

Dealing with the problems of information overload requires that analysts ask two questions when collecting and analyzing data: (1) what information is required and (2) how can it be determined it has been acquired. In other words, once the information is obtained, how can the analyst be sure that what was sought was in fact found?

Therefore, to research with a strategic purpose requires a step-by-step process. The first step is to conduct a broad-based survey of what information is available then examine as much of that material as possible to find new types of useful information. The next step requires defining the problem as completely as possible to help direct where to look for information to provide the answer. This can be accomplished by breaking up the problem into constituent parts. Thus, taking the challenge of acquiring information just one piece at a time will help to avoid information overload. Dividing the problem into different parts allows the analyst to decide what information is desired for that specific part (rather than focusing on the big, overall picture). Subsequently, the analyst must determine if the information for each part is actually obtainable.⁸

In following these guidelines, the analyst is aided in building a pool of resources that can be applied to scanning the respective environment. In turn, the decision maker is supplied information to be utilized in strategic planning through a vital tool, the environmental scan.

Environmental Scanning

As previously mentioned, environmental scanning (to be defined) exists as an important mechanism for presenting researched information and analysis. Therefore, understanding the

⁷ Taylor, Sarah M. “How Much Information is Enough? Decision-Making and Cognitive Analysis.” 10th International Command and Control Research and Technology Symposium: The Future of C2, June 13-16, 2005.

⁸ Ibid

overarching theory behind this tool becomes necessary before delving into the specific process carried out by the DSG at SSC San Diego.

Environmental scanning is the internal communication of external information about issues that potentially influence an organizations' decision-making process. The information gathered includes events, trends, and relationships that are external to an organization, then is provided to key decision makers and used to guide future plans. Another beneficial use of environmental scanning is to evaluate an organization's strengths and weaknesses in response to external threats and opportunities. In essence, it is the method for identifying, collecting, and translating information about external influences into active decisions. Environmental scanning is used to gain a strategic understanding of external influences to respond in ways that will ensure the organization' survival and success. The process focuses on the identification of emerging issues, situations and potential challenges that may affect the future of the organization. It allows an organization to address external competitive political, social, economic and technical issues that may be difficult to identify but are present nonetheless.

The environmental scanning process can be broken down into five steps, which, depending on the situation may overlap.⁹ These steps are:

1. Identify the environmental scanning needs of the organization
2. Gather the information (and utilize strategies to avoid information overload)
3. Analyze the information
4. Communicate the information and results
5. Make informed decisions

The initial steps of the environmental scanning processes can be a process in itself. One way of conducting this process is through specialized technology known as Data Mining. While this process is not used by the DSG, it nevertheless deserves attention given its prolific use and for highlighting the reasons why it is not used by the SSC San Diego DSG.

Data Mining: Advantages and Pitfalls

Data Mining is the process of extracting previously unknown, comprehensible and actionable information from large databases and using it to make crucial business decisions.¹⁰ Data Mining can itself be broken down into three steps: capturing data which is translated into applicable resources to the organization in a "Data Warehouse," the mining of this warehouse, and presenting this information to create knowledge and understanding.¹¹ Data capture encompasses the process of gathering, organizing and parsing through the data, eradicating duplicate data and filling in the missing pieces.

⁹ Albright, Kendra, "Environmental Scanning: Radar for Success" *Information Management Journal*. Lemexa: May/Jun 2004, Vol. 38, iss.3; pp. 38.

¹⁰ Simoudis, Evangelos. *Reality Check for Data Mining*, IBM Almaden Research Centre
<http://www.almaden.ibm.com/stss/papers/reality>

¹¹ Crawford, Jagoda and Frank Crawford. "Data Warehouse – Data Mining – Decision Support Source: Data Mining in a Scientific Environment." *Information Management* ANSTO, PMB 1, Menai NSW 2234 Australia

Much of the literature describing and promoting Data Mining revolves around specialized software and technology to initiate the information analysis process. However, given the type of research conducted by the DSG, and in particular the absence large databases from which it draws its information, the use of specialized data mining tools remains suboptimal. Indeed, the best avenue to provide situational awareness in this setting is through a collaborative team of analysts who participate in the environmental scanning process.

Experience of the DSG

As noted above, the DSG is tasked with supporting the strategic planning process at the Center by proving relevant and timely information to the leadership. Achieving this objective requires pulling information from multiple sources of value to the Center's leadership, including research and analysis of focused data from web-based and hard copy sources, through attendance to selected conferences, and via sources from a "community of interest."¹²

Once gathered, vetted, and analyzed, key and relevant information is disseminated to the Center leadership through environmental scans briefed at several fora, including the Center's monthly Strategic Planning Meetings wherein, as the name implies, the leadership discusses issues of strategic relevance. Environmental scans are briefed to a wider Center audience at bi-annual Tech Board meetings, as well as to directed groups at the behest of the Executive Director or Commanding Officer. Beyond the confines of the Center, the environmental scan is briefed to the leadership of Space and Naval Warfare Systems Command, the parent organization of SSC San Diego, at their quarterly Strategic Management Meetings.

Although the environmental scan constitutes the primary medium to disseminating information, websites and written material also assume prominent roles. Serving as repositories of environmental scans and source material, websites function as databases for the DSG to share information between its members, as well as with the leadership should they request a greater level of granularity on a topic briefed in any given scan. Additionally, the DSG drafts an "all-hands" e-mail on behalf of the Commanding Officer that highlights information in the monthly scans, and assists with constructing the strategic plan. Finally, the DSG serves as a knowledge broker, providing information to individuals at the Center at their request. Environmental scanning is the main method of supplying information to the leadership.

Environmental Scanning at SSC San Diego

The process of environmental scanning utilized by the DSG is depicted by Figure 4. As illustrated, the environmental scan serves as a critical component in the overall strategic planning process, particularly in ensuring informed actions and decisions.

¹² This exchange of data and information between and among members of a similar community of interest is a methodology not often discussed in the academic literature on the subject. However, the exchange of information with colleagues in multiple locations: other laboratories, systems commands, the Navy and Office of the Secretary of Defense (OSD) staff, naval officers on fellowship with a variety of "think tanks," former DSG members and others is a rich source of information. This exchange of information has developed its own "business rules" (i.e. if you provide me information, I will do the same, no acknowledgement is usually required when information is received, passing along another's information is o.k. unless specifically prohibited, etc.).

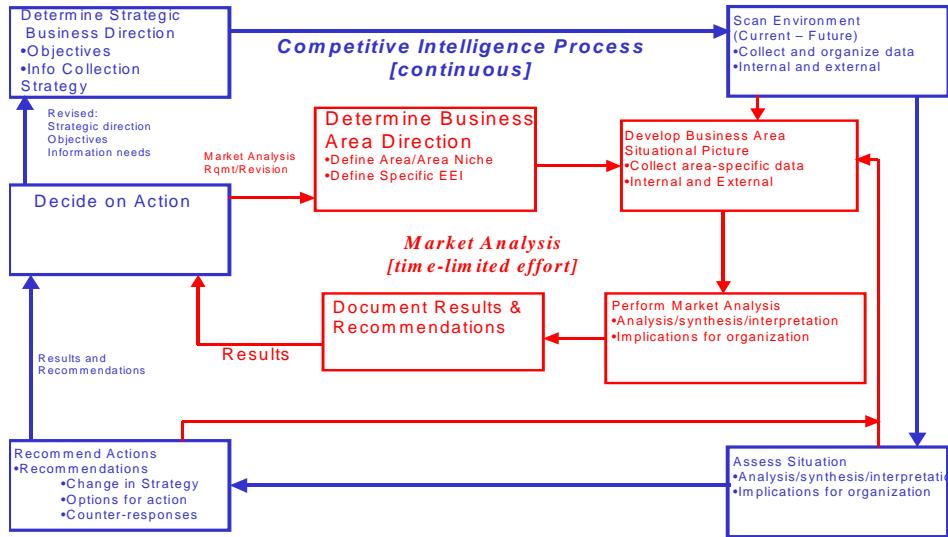


Figure 4: Environmental Scanning Process

The environmental scanning process can be broken down linearly; specifically the DSG employs a modified five-step process and is depicted in Figure 5.



Figure 5: Environmental Scanning Process Used by DSG

The first step to the environmental scanning process constitutes identifying the information needs of the organization. Again, the vision of SSC San Diego is to be the preeminent provider of C4ISR technology for the Warfighter in the maritime domain. Hence, the environmental scanning needs for SSC San Diego are to support this vision, which requires tracking the current military strategies of the United States, the policies and ‘news’ of the DoD writ large, as well as the federal government and the strategic plans set forth by the Navy’s Chief of Naval Operations. It is paramount that the Center leadership remains informed of the current events and policies so that the work of the Center aligns with the strategy of the USN while also meeting the needs of the Warfighter.

The DSG pulls information from multiple sources that are valuable to the leadership, ranging from the present political issues to national security issues. Scanning the “universe” for the DSG involves various temporal scans (ranging from daily to monthly) of major newspapers, press releases from federal agencies and the branches of government, as well as a broad range of publications ranging from the most esoteric to those of wide distribution.

To facilitate effective environmental scanning at SSC San Diego, and implement the second step of environmental scanning (scanning the data), the DSG created categories considered relevant to enhancing the situational awareness of the leadership. Consequently, in this regard, each environmental scan presents eight categories diligently researched by the DSG. These eight categories are described in Table 1:

Category	Definition/Purpose of Category
Top-Down Strategy	Briefing on the high level strategy of the federal government and regularly consists of describing the current geopolitical environment (e.g. developments in China as they relate to the US military)
Transformation Update	A major priority of the Secretary of Defense is to transform the Department of Defense (DoD) from its archaic Cold War characteristics to a streamline agency capable of meeting the needs to fight the Global War on Terror. There are consistent reports, newspapers and such tracking these changes
Requirements Changes	Policies, directives, and trends that affect, or have the possibility of impacting, the technological, organizational, and budgetary requirements of the military services, and the effect these will have on work at SSC San Diego
Budget Update	As summed up in the notional topic, it is important for a governmental organization to be aware of the status of the federal budget
Defense Infrastructure	This category involves the sublevels of the DoD and tacks the current events of such offices as the Joint Chiefs of Staff
Technology Trends	Being a research and development lab, tracking the technology trends in industry, specific emerging technologies designed for the military, is highly relevant information for leadership of any laboratory
Personnel and Organizational Changes	In understanding that the Center is also a military enterprise, it is important for the leadership to be conscious of personnel and organizational changes and therefore involves reporting on new appointments to offices, changes in command, etc.
Quickhitters	Depending on the time of year, and to allowing for flexibility in providing information, quickhitters serves as the potpourri category to supply information deemed significant to leadership but which does not fit in any other category

Table 1: Categorization of Information Presented in Environmental Scan

The final stages of the process culminate in the production of the environmental scan, accomplished through PowerPoint presentations and the actual briefing of the environmental scan and monthly Strategic Planning Meetings. In order to effectively produce the environmental scan, the DSG delegates specific categories to various independent analysts. This allows for specialization and avoids duplication of collecting, analyzing and presenting of information. Moreover, the production process builds off of a community of interest.

Environmental Scanning Case Study: Technology

To scan the technological environment and emerging technologies, a pool of resources initially needed to be established for future environmental scanning and tracking. Given the environment of which SSC San Diego operates, as a science and engineering research lab, as well as part of the USN and the DoD, several avenues of analysis exist, ranging from governmental publications, to technical websites, to magazines.

Additionally, it is important to ensure that the emerging technologies scan aligns with the mission and vision of the Center. Consequently, although the information is presented to the leadership of the Center for purposes of maintaining situational awareness, it is never forgotten that the ultimate customer is the warfighter and therefore tracking technology that applies to improving the warfighters' capabilities is paramount. Again, given its nature, understanding the core competencies of the Center proves useful; thus technology scans are broken down initially by core competencies applied to the different departments found at SSC San Diego: Command and Control; Communications; Intelligence, Surveillance and Reconnaissance; Navigation and Applied Sciences; and Fleet Engineering.

Process Applied to Technology

The first stage of the environmental scanning specific to technology is the initial building of resources and the subsequent organization of those sources. To build the pool of resources, information is segregated by different sectors (and the data of course relates specifically to technology). Through the evolution of establishing the DSG, six sectors to scan were identified: USN, the DoD, federal government writ large (different branches of government and executive agencies), academia, consulting firms and think tanks, and finally open media (newspaper articles and industry appropriate magazines and so forth). The subsequent step in the organization of technology information is to apply it to the appropriate category established by the departments in the Center. The information is divided according to the different departments, or technology specializations of SSC San Diego noted at the end of the previous section. Therefore, in order for the technology portion of the environmental scan to have application, it is apparent that the DSG must understand the mission and vision statements of each separate department, which creates boundaries utilized in narrowing the scanning. Moreover, in organizing the information in such a way, the DSG provides for the environmental scan to be the effective strategic tool it is capable of being; by becoming a mechanism to report potential business development areas for the Center.

As seen in Table 2, which is *not* an exhaustive list but merely for demonstrative purposes, a majority of the research of information is open source, non-confidential and available online.

Sector	Resource
US Navy	Naval War College Strategic Studies Group Office of Naval Research Science and Technology Focus
Department of Defense / Military	Defense Science Board Command Control Research Program Office of Force Transformation (DOD) Center for Technology and National Security Policy DARPA Joint Warfare Defense Technology Objectives
Government	CENDI Government Portal to search science web sites CIA/NCI publication: "The Global Technology Revolution: Bio/Nano/Materials Trends and Their Synergies With Information Technology by 2015"
Academia	Peer Reviewed Journals MIT Technology Review Journal Information Science and Technology Portal
Consulting Firms / Think Tanks Military Focused Organizations	Battelle Technology Forecasts National Defense Industrial Association Defense Industry Daily Government Electronics and Information Association Institute of the Future
Open Media	News Scientist Wired magazine C4ISR Journal PC Magazine TIME
Other	Email distributions from 'news trackers' in industry

Table 2: Information Sources for Technology

Once the data had been collected and organized the next step in the process becomes easier. The second step in the process is the actual scanning of the information. This varies from daily, weekly, monthly depending on the source. It is paramount that the leadership is abreast of the emerging technologies across several fields of science and engineering, albeit in basic research developments, to the "happening" technologies of industries. However, it is not forgotten that for the data to be applicable and of interest to the leadership, data must pertain to the work of the center, i.e. the different facets of C4ISR.

The third step is the analysis of the information. The objective is to apply the information and emerging technology or technology forecasts to the appropriate technology specialization. Then it becomes important to determine if any current projects at SSC San Diego and Program Executive Office for Command, Control, Communications, Computers and Intelligence (PEO C4I) are on track with the noted emerging technologies. Another aspect of the analysis step is in supporting situational awareness is that it describes the current competing technologies as well. Analyzing the information, therefore, requires not only mapping the technologies to the corresponding department at the center, but also in monitoring the competing private providers.

Fourth, communicating the information and results, again is accomplished through the environmental scan, and making available more in depth analysis upon request. The goal is to

communicate what emerging/predicted future technologies are in those respective technology categories as well as with industry at large. The fifth and final step is to serve as a conduit of information to the leadership in order for them to make informed decisions

Once the information is analyzed and communicated to the leadership, the ultimate desire is that it is effectively utilized in making business decisions. As a result, an important aspect to the environmental scan and specifically to the focus of technology, is finding applications of the information to provide business growth and development for the Center. Thus, to apply the information, it becomes important to highlight potential business development opportunities for the SSC San Diego leadership. In order to effectively accomplish this task, the DSG must also understand SSC San Diego's customer base is primarily meeting the needs of the warfighter. Consequently, understanding the current military policies and demands (requirements) as analyzed in the other sections of the environmental scan¹³ tie into the analysis and ultimate presentation of the emerging technologies. Additionally, once the emerging technology and technology trends are mapped to the corresponding departments within the Center, it is then that the technology capabilities are mapped to meeting the requirements of the warfighter. The potential applications do not end there, and again given that the Center is a working capital fund it is important to highlight the potential business opportunities outside of the USN. The capabilities offered by SSC San Diego are not restricted to the USN, but rather business development possibilities are emerging within other federal agencies, such as the Department of Homeland Security (DHS).

Overall Recommendations for Establishing a Collaborative Research Group

Based on our experience and insight as members of the DSG, several recommendations should be considered before establishing a team of collaborative analysts that provide situational awareness to the leadership of an organization. These recommendations are:

- Elicit a commitment from management to establish such a group
- Encourage the group to produce a strategic tool such as environmental scans
- Conduct talent search for members with broad backgrounds
- Establish a process to search for, analyze, and present information
- Set up a “help desk” function to build the reputation and credibility of the team
- Keep the group intact over time to ensure unit cohesion

Conclusion

This paper has endeavored to demonstrate how a dedicated collaborative team can provide key information and enhanced situational awareness to the leadership of a large research institution. Establishing a collaborative team akin to the DSG requires commitment from top management, one reinforced through active involvement of said group in discussions of strategic relevance. Talent of a multidisciplinary nature is important in order to provide as holistic an analysis as possible. Finally, unit cohesion constitutes an important component in order to foster a dynamic, closely-knit unit able to function as a single entity with a common goal.

¹³ See previous discussion on p. 11, specifically Table 1: Categorization of Information Presented in Environmental Scan

Since its inception, the DSG has contributed to the institutionalization and formalization of the strategic planning process, but providing relevant and pertinent analysis through environmental scans remains its *raison d'être*. Continually reassessing its role and the value it brings to the organization it serves, the DSG endeavors to internalize best practices and lessons learned with the aim of providing the leadership of SSC San Diego the means to strategically position the lab at the forefront of technological innovation and preeminence in the field of C4ISR.

CCRTS 2006

The State of the Art and the State of the Practice

June 20 – 22, 2006

***Maintaining Situational Awareness in Large,
Complex Organizations***

Mr. Jose Carreno

Mr. George Galdorisi

Ms. Rebekah Goshorn

SPAWAR Systems Center, San Diego

Background

Space and Naval Warfare Systems Center, San Diego

- C4ISR research and development facility
- Over 3,500 civilian and military personnel
- \$1.4 billion budget
- Functions as a working capital fund

Presentation Objectives

- Address theory of environmental scanning
- Analyze methodology used at SSC San Diego

Introduction:

Outline of Presentation

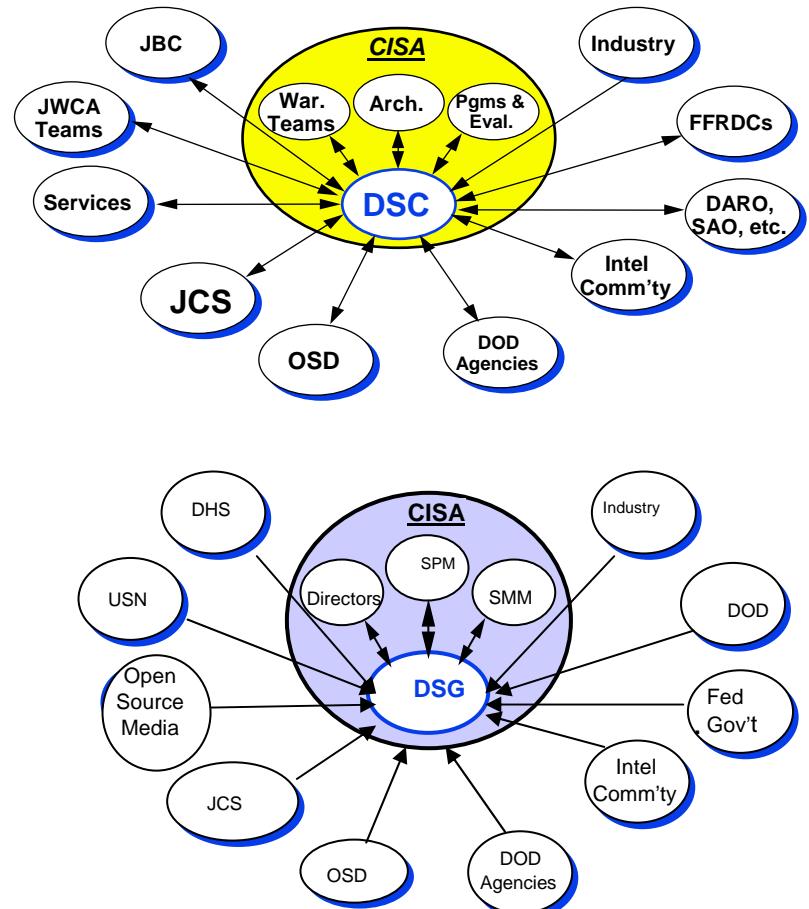
- Establishment of the Decision Support Group
- Goals of the Decision Support Group
- The Challenge of Providing Information
- Theory of Environmental Scanning
- Environmental Scanning at SSC San Diego
- Case Study: Technology
- Overall Recommendations

Objective, Challenge, Approach

- ***Objective:*** Provide situational and strategic awareness to leadership of a complex organization
- ***Why:*** Avoid strategic surprise, facilitate strategic planning, ensure strategic relevance
- ***Key Challenge:*** Turn large amounts of information and data into knowledge
- ***How:*** Environmental Scanning
- ***Who:*** Decision Support Group

Establishing the DSG

- Experience of Decision Support Center (DSC)
 - Build a network of information
- Key Factors:
 - Management Commitment
 - Talent Search
 - Build a process to search, analyze, and present information



Decision Support Group

- Collaborative team of analysts
- Provides situational awareness to leadership of:
 - SSC SD at monthly Strategic Planning Meetings
 - SPAWAR HQ at quarterly Strategic Management Meetings
- Draw information from several sources:
 - Web-based
 - Hard copy
 - Conferences
 - Community of Interest
- Primary tool: Environmental Scan

Annual Iterative Tasks

RED - Events BLUE – Core Products

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SPM	SPM	SPM									
SPM agenda	SPM agenda	SPM agenda	SPM agenda	SPM agenda	SPM agenda	SPM agenda	SPM agenda	SPM agenda	SPM agenda	SPM agenda	SPM agenda
ES	ES	ES									
All Hands E-mail			All Hands E-mail			All Hands E-mail			All Hands E-mail		
Tech Board									Tech Board		

- DSG briefs Environmental Scan at monthly Strategic Planning Meetings (SPMs)
- Assumes a key role in strategic planning process at SSC San Diego

Annual Periodic Tasks

BROWN - Framework RED - Red BLUE - Core Products GREEN - Ongoing Processes

Strategic Plan, Yearly Calendar and Balanced Scorecard

ONGOING PROCESSES

- BSC/SPM/Tech Board/
event organizer
- Analysis and Research
- Bring in external speakers
- Departmental reviews
- Liaison with Center groups
- Liaison with outside entities
- Organize and facilitate
meetings

EVENTS

- NWC visits
- Center-wide
meetings
- Outside meetings,
conferences

CORE PRODUCTS

- Center Overview
- Center Vision
- Action/Decision Web Tool
- ES Websites
- Analysis products
- Action Items
- Minutes
- Briefs delivered by Center
Leadership

Challenge of Providing Information

- Information Overload
- Use of Best Practices
 - Analyst must ask two questions
 - What information is required?
 - How can it be determined it has been acquired?
 - Research Process
 - Broad-based survey
 - Define the problem and break into parts
 - Determine if the information is obtainable
 - Environmental Scanning

Environmental Scanning: Theory

- *Defined:* Internal communication of external information about issues that may influence an organizations' decision-making process and used to maintain competitive advantage
 - Events, trends, relationships
 - Evaluate strengths and weaknesses
- *Five Step Process:*
 - Gather the data
 - Scan the data
 - Analyze the data and convert it to information
 - Communicate the information and results
 - Make informed decisions

Environmental Scanning: at SSC San Diego

- Identify the information needs of organization
 - Support the vision of SSC SD is to be preeminent provider of C4ISR technology to the warfighter
- Scanning the pool of resources used by DSG
 - Newspapers, press releases, government publications
 - Organize according to eight categories
- Analyze and Transform Data
- Communicate information through Environmental Scan
- Present Environmental Scan at strategic planning meetings



Environmental Scanning: at SSC San Diego

Category	Definition/Purpose of Category
Top-Down Strategy	High level strategy of the federal government and current geopolitical environment
Transformation Update	Priority of the Secretary of Defense is to transform the Department of Defense (DoD) from Cold War characteristics to a streamline agency
Requirements Changes	Policies, directives, and trends that affect, or have the possibility of impacting, the technological, organizational, and budgetary requirements of the military services, and the effect these will have on work at SSC SD
Budget Update	Monitoring current status of federal budget
Defense Infrastructure	Sublevels of the DoD and tracks the current events of such offices as the Joint Chiefs of Staff
Technology Trends	Tracking the technology trends in industry, specific emerging technologies designed for the military
Personnel/Organizational Changes	Reporting on new appointments to offices, changes in command, etc.
Quickhitters	Potpourri category to supply information deemed significant to leadership but which does not fit in any other category

Environmental Scanning Case Study: Technology

- Build pool of resources from different sectors

Sector	Resource
US Navy	Naval War College Strategic Studies Group Office of Naval Research Science and Technology Focus
Department of Defense/Military	Defense Science Board Office of Force Transformation (DoD) DARPA
Government	CENDI CIA/NCI publications
Academia	Peer Review Journals MIT Technology Review Journal
Consulting Firms/Think Tanks	Battelle Technology Forecasts National Defense Industrial Association Government Electronics and Information Association
Open Media	Wired Magazine C4ISR Journal
Other	E-mail distribution from “news trackers” in Industry

Environmental Scanning Case Study: Technology

- Organize information according to departments
 - Command and Control
 - Intelligence, Surveillance and Reconnaissance
 - Communications
 - Navigation and Applied Sciences
 - Fleet Engineering
- Scan the information
 - Retain useful and relevant data
 - Periodicity of scan varies

Environmental Scanning Case Study: Technology

- Analyze information
 - Determine how information aligns with work at Center
 - Flag key technological developments and trends
 - Identify business development opportunities
- Communicate information and results via:
 - Environmental Scan
 - Internal website
- Follow up on requests for additional information

Closing Thoughts

- Enhancing situational awareness not a trivial undertaking
 - Environmental scanning demands time and attention
 - Information overload remains a key challenge
- DSG experience remains a work-in-progress
 - Constant assessment of performance
 - Periodic review of methodology
 - Strive for continuous learning
- Environmental scan a tool tailorable to different organizations
- A collaborative group of analysts represents one approach

Overall Recommendations

- Commitment from top management
- Talent search for members with broad background
- Establish a process to:
 - Search for information
 - Analyze information
 - Present information
- Set up a “help desk” function
- Keep group intact over time to ensure unit cohesion